THE JOURNAL OF GEOGRAPHY

VOLUME IX JUNE, 1911 NUMBER 10

GEOGRAPHIC INFLUENCES IN THE DEVELOPMENT OF CALIFORNIA

By JAMES F. CHAMBERLAIN

State Normal School, Los Angeles, California

A HALF CENTURY after our national capital was established at Washington, what is now the state of California was a foreign possession. Cortez, in his search for the fabled cities of Cibola, sent an expedition up the Colorado River in 1535. Finding that the river flowed through a desert, the expedition turned back without attempting to explore the land. In 1542—3 Cabrillo sailed along the coast, but it was not until 1769 that the Spanish attempted to settle in the country.

Franciscian fathers, journeying northward from Mexico, established a mission at San Diego in 1769, thus laying the foundations of a great ecclesiastical system which included 21 missions, and extended northward to Sonoma. The missions rapidly acquired wealth, for great numbers of horses and cattle were pastured, and there were orchards and vineyards.

Although Indians possessed the land, the Spaniards achieved a peaceful conquest. The natives accepted Christianity, and were taught the arts of peace. They were held in a sort of slavery, and performed most of the manual labor. They learned to make the sun-dried bricks, and assist in the erection of buildings. They helped tend the flocks and herds, harvest the crops, make and repair tools, and were useful in many other ways.

For a time the commerce of California was restricted to the mother country, but as early as 1788 ships from New England entered her ports. Cattle, hides and tallow were exchanged for manufactured goods.

Under Mexican rule the same easy-going life existed in California. The people lived upon great estates over which cattle and horses roamed. The owners of these vast *ranchos* entertained their friends or the passing stranger with open-handed hospitality. Under such social conditions there could be practically no industrial development. When Commodore Sloat raised the United States flag at Monterey in 1846 a new era opened for California.

Geographic influences have been and are very potent in shaping the development of the Golden State. Position, topography, climate, soil,

mineral wealth, have each played a part. The subject is so vast that it can only be touched upon in this article.

TOPOGRAPHY AND ROUTES OF TRAVEL

For about 400 miles the Sierra Nevada Mountains rise like a mighty wall along California's eastern border. Lofty, steep, bare and forbidding they face the direction from which the expansion and development of our country have come. The peaks range from 10,000 to more than 14,000 feet in altitude, and for 200 miles in that part of the system extending southward from Lake Tahoe, the crest is in few places below 11,000 feet. As though this barrier were not sufficient, a desert extends eastward from its foot, being in places, several hundred miles in width. Naturally the routes by which the state could be most easily approached and entered, were of great importance in determining its settlement and development.

It was the hunter, the trapper and the trader who first pushed westward across the Appalachian barrier, and made known something of the possibilities of the vast empire beyond. Adventurous and brave spirits of these same classes were the first to enter California from the east. The search for beavers, and other fur-bearing animals, had led men well toward the headwaters of the Missouri as early as 1806.

The first party to enter California overland seems to have been that under the leadership of Jedediah Smith, which in 1826 worked its way from Great Salt Lake to San Diego. This expedition was not followed up, but in 1830 a Kentucky trapper named Wolfskill, followed what came to be one of the important routes to California. From the Grand and the Green he led his party across the Wahsatch Mountains and south to the Sevier. From the headwaters of this stream he passed to the Virgin which he followed nearly to the Colorado, and crossing the Mohave Desert, reached Los Angeles by way of the Cajon Pass, 4,560 feet in altitude. This came to be called the *Spanish Trail,* and a great deal of trade between Santa Fe and California passed over it.

In 1905 the Salt Lake Railroad was completed. It is interesting to note that for a long distance it practically follows the Spanish Trail. This road furnishes very direct communication with the East, and it is doing an extensive business. As we cross the Mohave Desert we get some idea of the horrors which, in the early days, attended a journey over its burning sands with their infrequent water holes.

The Gila valley was a favorite trapping ground. It was reached from the head streams of the Rio Grande. In 1827 two Kentuckians followed the Gila to the Colorado and so reached San Diego. This, which came to be a well-traveled route, was known as the *Gila Trail.* General Kearney followed this route, when, in 1846 he was sent to the Pacific Coast, and in the same year Kit Carson passed over it bearing dispatches from Commodore Stockton to the National capital.

Here again, the old and the new join hands, for the Southern Pacific

follows the Gila Trail for a long distance. It will be noted that both the Spanish and the Gila Trails, and the railroads which now in a general way follow them, enter California *south* of the Sierra barrier.

Occasionally a member of these early expeditions to California remained in the state. In this way 30 men were added to the population between 1831 and 1835.

From about the year 1825 the trade with Santa Fe increased steadily. This, together with the fur trade, led to the establishment of a well defined trail to the ancient city of Santa Fe. Independence, Missouri, was a common starting point, and whatever the destination, the traders usually traveled in companies known as *"trains,"* which consisted of a number of "prairie schooners" drawn by oxen, mules or horses. Even with the protection thus afforded, there was much danger on account of the Indians.

From Independence the "trains" traveled southwest to the great bend of the Arkansas, and then followed up this stream to what was known as Cimarron Crossing, near where Dodge City now stands. The Cimarron and Canadian rivers led to Las Vegas, from which Santa Fe was reached by a trip of about 50 miles across the mountains. Those who have traveled over the Santa Fe railroad have followed for a part of its course, what was known as the *Santa Fe Trail.* The pass which today admits the Santa Fe Railroad to California's seaward slope, is the one that was used by those who traveled the Spanish Trail. The Santa Fe now shares this pass with the Salt Lake railroad.

The importance of Santa Fe as a trading center, the influence of the Colorado and its tributaries in guiding travel, the low passes in the south, and the comparatively high winter temperatures along the southern trails, were responsible for the fact that Southern California had land communication with the East sooner than had other parts of the state.

From Independence and other near-by points "trains" traveled northwest to the Platte. This stream they followed to Fort Laramie. The valley of the Sweetwater then led to South Pass, 7490 feet in altitude. By the Green, Black, the Muddy and the Bear, the trail was continued to the Snake, and thus the trains finally reached the mouth of the Columbia. This was the famous *Oregon Trail,* 2400 miles in length. The father of the writer several times passed over that portion of it between Council Bluffs and Great Salt Lake.

In 1841 a party left the Oregon Trail at a point on the Bear River, and journeying westward followed the Humboldt and the Walker to the Sierra Nevadas. Near Sonora Pass, at an altitude of 10,115 feet, the crest was reached. The San Joaquin valley was entered by way of the Stanislas. Three years later the Truckee Pass (7012 feet) was discovered. From the Truckee River the trail passed to the American, which

led to Sacramento. This route was called the *California Trail.* As early as 1845 families began to enter the state over this trail.

It was the Humboldt, the longest river in Nevada, and the Truckee Pass which determined the course of the Union Pacific from Ogden to California. The recently opened Western Pacific follows nearly the same course, crossing the Sierras a little to the north of the Truckee Pass.

From yet another source California received some settlers in the early days. Occasionally a party that had reached the coast by the Oregon Trail, followed up the Willamette and over the mountains to the Sacramento. Through this gateway the "Shasta Route" now operates.

There were thus four streams of population entering California from the landward side. These came in over the Yuma, the Spanish and the California Trails, and by way of the Willamette and Sacramento. As we have seen, important lines of railroad now follow these trails in a general way.

California's great western portal is the Golden Gate. Rather than endure the trials and dangers of an overland trip, many chose a water voyage. Some went around Cape Horn, and others crossed the Isthmus of Panama, and then continued the trip by water. From here radiate routes to all parts of the world. The meeting of land and water routes in the Bay region has led to a great center of population, just as the convergence of routes in the south has contributed to the development of a second center of population.

MINERAL WEALTH

It was apparently a matter of little moment when James Marshall on the nineteenth day of January 1848, discovered flakes of the yellow metal in the mill-stream near Coloma, yet the cry which heralded this discovery was heard in every part of the United States, and even in lands beyond the sea. Such was the magic in this cry, that old and young alike turned their faces toward the setting sun, willing to endure toil, privation and danger for the sake of gold.

When, in 1848, Mexico ceded California to the United States, the estimated white population was 12,000. In 1850 it had reached 92,597. This wonderful growth in population can be fully appreciated only, when we bear in mind the fact that there were no transcontinental railroads in those days, and that the overland trip from the Missouri River to California required fully three months. The rapid increase in population led to the admission of California as a state in 1850.

At first the gold was "washed" from the sands and gravels of the streams. Later hydraulic mining was employed. By this process so much material was washed into the streams that it was in many places prohibited by law. The gold was obtained in the form of flakes and nuggets. The largest nugget ever found weighed 195 pounds, and was worth

$43,534. In time stamp mills were set up, and these are now established throughout the whole extent of the Sierras.

As new "diggings" were opened towns sprang into being to have a permanent or an ephemeral existence according to the richness of the new find. Because of the primitive methods employed in the early days, many mines were abandoned, which in later years have been worked at a large profit. The growth of the industry can be grasped when it is stated that the output of gold increased from $245,301 in 1848, to $10,151,360 in 1849, $41,273,106 in 1850, $75,938,232 in 1851, and $81,294,700 in 1852, when the maximum annual output was reached. During the last ten years the amount produced annually has averaged about $17,000,000. From 1848 to 1909 inclusive, the value of California's total yield of gold was $1,489,751,561. Out of a total of 58 counties in the state, 31 showed a yield in 1909. Butte, Nevada, Yuba, Calaveras, Sacramento and Shasta counties are the big producers.

In addition to causing a rapid increase in population, social conditions which did not exist on the same scale in other parts of the country, and the early admission of the area as a state, the great gold output gave California rail connection with the East many years before it would otherwise have come about. Construction began on the Union Pacific in 1863, and the road was rushed to completion in 1869.

The terrors of the desert are not sufficient to prevent the prospector from venturing upon its almost waterless wastes. Johannesburg and Randsburg are examples of towns that have grown up because of mining. So important have they become, that a railroad has been constructed to them. The automobile has in part conquered the desert, as its use makes it possible to cover long distances in a short time.

For many years gold will continue to be one of the important resources of the state. Improved methods, the exploitation of the desert, and the dredging of river sands are important factors in keeping up the output.

Until recent years gold reigned supreme among the minerals produced in California, but in 1907 it yielded first place to petroleum. California now holds first rank among the petroleum producing states of the Union. In 1909 the output was 58,191,723 barrels, valued at $32,398,187.

Manufacturing, so long retarded in California because of lack of coal, is now receiving considerable impetus through the use of crude oil. It is of tremendous economic importance to the railroad companies, being used as a fuel for locomotives in all parts of the state. Its use makes traveling by rail enjoyable because of the absence of cinders. In Southern California crude oil is extensively used on the country roads. This produces a most excellent road-bed practically free from both mud and dust. As the petroleum industry is treated elsewhere in this number, nothing more will be said here.

The mineral products of California are varied in character. In addi-

tion to gold and petroleum, copper, clay, cement, macadam, asphalt, silver and mercury are important. The total value of the mineral output of the state for 1909 was valued at $82,972,209. With the single exception of the year 1905, when there was a very slight falling off, the value of the annual output has increased steadily since 1892.

California is the only state in the Union that produces quicksilver in commercial quantities. While it occurs in the Sierra Nevadas, the yield is confined to the coastal section, San Benito and Santa Clara counties being the chief producers. This resource is particularly important because of the gold industry.

There are valuable deposits of brick and pottery clays in many counties. Los Angeles County leads in the production of this, having large establishments for the manufacture of common, pressed and fire bricks. San Francisco County ranks second in importance.

CLIMATE

For many years it was the lure of gold that drew people across the plains and over the mountains and deserts to California. Today the population of the state is increasing with marvelous rapidity, but it is in response to a climate which confers pleasures and benefits which the mere possession of gold will not secure. The climate of California is a definite resource, as truly as are mineral wealth, timber and fertile soil, and its influence in the development of the state has been, and will continue to be, very great.

For about 700 miles California fronts on the Pacific Ocean, the waters of which, winter and summer, are mild in temperature, averaging near the coast 55 degrees F. The prevailing winds are from the ocean to the land, and hence the climate of most of the lowlands west of the Sierras is characterized by mildness and uniformity. This is strikingly illustrated by the trend of the isotherms which is practically north and south. The mean annual temperature at Eureka, latitude 40°-48′ north, is 51.5° F., while that of San Diego, latitude 32°-45′, is 61.4° F.

In California altitude and distance from the ocean exert a stronger control over temperature than does latitude. In the Sierras temperatures far below 0° F. have been recorded, and there are many small glaciers. In valleys from which the sea breeze is cut off, high summer temperatures occur, and on the Colorado Desert shade temperatures of 130° F. have been registered. At Salton the temperature from May to September inclusive, averages about 95° F. To those unacquainted with arid regions these figures will convey no accurate impression. Owing to the dryness of the atmosphere sunstroke is practically unknown in California, and work is attended with little discomfort and no danger at a temperature of 100° F. The rapid radiation after sunset, due to low relative humidity, results in giving to many sections delightfully cool nights.

In considering the climate of an area, seasonal range in temperature is a matter of great importance. In this connection the following table will be of value.

Cities	Av. July Temp.	Av. Jan. Temp.	Range
Eureka, Cal.	55° F.	46° F.	9° F.
San Francisco	58° F.	50° F.	8° F.
San Diego	67° F.	53° F.	13° F.
St. Louis	78° F.	23° F.	55° F.
Chicago	72° F.	22° F.	50° F.
St. Paul	74° F.	12° F.	62° F.
New York	75° F.	30° F.	45° F.
Boston	70° F.	26° F.	44° F.
Washington, D. C.	77° F.	35° F.	42° F.
New Orleans	83° F.	54° F.	29° F.

This table shows that on the lowlands of California, and this of course is where most of the population is found, change of seasons is not accompanied by any great change in temperature. No extensive preparation for a cold winter is required, and all parts of the year are "growing seasons."

As is well known, California has but two clearly defined seasons, the rainy and the dry. Most of the precipitation occurs between November first, and April thirtieth. In San Francisco about 91 per cent of the annual rainfall occurs during this period, while in Los Angeles 96 per cent falls during the same time.

Owing to the great relief of the state, there is a wide range in the amount of rainfall in different sections. On the windward slopes of the Sierras it amounts locally to more than 75 inches annually. The northern Coast Mountains receive an abundant supply of rainfall. Hence there are great forests in these regions, and lumbering is carried on extensively. In the Great Valley and east of the Sierra Nevadas, precipitation is light. Over a large area in the southwestern part of the state the rainfall amounts to less than five inches annually.

Because of the light precipitation on the lowlands, irrigation is quite generally employed except in the case of grain crops, deciduous fruits and grapes. Irrigation leads to cooperation in the development and distribution of water. Under irrigation crops are more certain and are larger than they are where rainfall is depended upon. Irrigated farms are, as a rule, small. Hence the rural population in the irrigated districts is relatively dense. This leads to the securing, by very young communities, of excellent roads, trolley lines, telephones, rural delivery, schools, libraries, churches and other social institutions.

Absence of summer rainfall is absolutely necessary to the most successful development of several important industries in California. The grain crops are harvested without anxiety or loss—a matter of great importance. There are no storms to cause the growing crops to "lodge," or to damage

the crop after it is cut. The dry weather makes possible the use of the combined harvester, a machine that cuts, threshes and sacks the grain, averaging in some cases 70 acres per day. These machines are, with few exceptions, manufactured in Stockton.

The growing of deciduous fruits is very important in California. Some of these, particularly the peach and the apricot, are dried and exported in large quantities. As the drying takes place in the open air, it is evident that summer rains would mean a great loss to this industry. The raisin industry is carried on successfully in few parts of the world, because a high temperature combined with very low humidity is required to evaporate the moisture from the grapes. Fresno County, in the San Joaquin valley, is particularly well adapted to this industry. Here, with a temperature of more than 100° F., the humidity is sometimes less than ten per cent. and the hours of sunshine during the year average 74 per cent of the possible hours of sunshine.

The Franciscan missionaries, in a very imperfect way, laid the foundations of one of the great industries of California—the growing of citrus fruits. The production of these fruits is restricted to areas having very mild winter temperatures. Owing to the influence of the ocean the lowlands of California are not subject to cold waves, such as at times do great damage in Florida. Locally some damage is occasionally done by frost, but this is usually prevented by "smudging." The owners of large groves keep in touch with the nearest Weather Bureau station, and thus receive timely warning when killing frost is likely to occur.

In the early days it was thought that Southern California was the only section of the state in which oranges could be successfully grown, but there are now as far north as Butte County, orchards yielding delicious oranges. Owing to the fact that summer temperatures are higher in the Great Valley than they are on the Coastal Plain of Southern California, the fruit ripens earlier in the northern sections.

The industry could make no great strides until the first transcontinental railroad was completed in 1883. In Southern California alone the citrus fruit crop for the year 1909-10 was valued at about $20,000,000. The output is increasing, new areas are being developed, and citrus fruit lands are increasing in value. On March 15, 1911, there were 373 cars of citrus fruits shipped from Southern California over the Santa Fe and the Southern Pacific railroads.

On the Colorado Desert in southeastern California, several industries give promise of becoming very important because of the high temperatures that exist there. The Imperial Valley and other areas have been reclaimed, and where but a few years ago there was a desert waste, we now find a splendid farming country and thriving towns. The growing of long staple cotton is attracting much attention, and in the near future cotton mills will probably be established in Los Angeles. The United

States Department of Agriculture has taken up date culture at Indio and Mecca, and this year a crop was harvested.

Striking features of the climate of California are the low wind velocities, and the high percentage of sunshine. In San Francisco the percentage of possible sunshine is 63, in Los Angeles 73 and in Fresno 74. For New York the figures are 56, and for Chicago 57.

Mild winter temperatures, low humidity preventing oppressive summer heat, the invigorating sea breeze in the coastal regions, the absence of thunder storms and violent winds, and the high percentage of sunshine combine to make life in California particularly enjoyable. These conditions are rapidly increasing the demand for land, and filling the state with an intelligent, thrifty and happy population.

TOPOGRAPHIC ENVIRONMENT OF SAN FRANCISCO

By Ruliff S. Holway

University of California

TO THE physiographer San Francisco is noteworthy for its location on a bay occupying a sunken valley situated on a rising coast. To the geographer San Francisco is interesting as the port at the mouth of the only low pass that opens entirely through the central thousand miles of the Coast Range System which rises abruptly along the western shore line of the United States. To the student of human life San Francisco is remarkable for the energy and courage of its cosmopolitan people—cosmopolitan yet not so removed from a certain youthful provincialism of the West but that they still encourage tales of the wickedness of their Bohemian ways rather than point to the sturdy but thoroughly unconventional morality that is carrying the city safely onward to its great future.

How is it possible to compress into four pages the story of the evolution of the marked topographic forms of this new country still being made, and being made so rapidly that we can watch the processes? And at the same time discuss the geographic situation of the Golden Gate that makes San Francisco the center of the forces which will shape the history of the Pacific as it is quickened by the life currents which will flow through the man-made Straits of Panama? And shall the same short Journal article attempt to portray the Oriental color of life and building in unassimilated Chinatown and yet analyze the subtle civic influences that permit Little Italy, for example, its cherished foreign atmosphere even while making every man a genuine Californian before he fairly learns our tongue?

A volume were all too short to present adequately any one of these aspects of the western metropolis and so the present article will be devoted to suggestions of those physical features in the immediate vicinity of San Francisco which may easily be reached and studied for themselves by the members of the National Education Association during its coming session. The physiographic aspect is chosen not because it is necessarily the most interesting even to the writer, but because the other two are more frequently discussed in current literature and because they are thrust upon the careful observer wherever he wanders in Greater San Francisco. But the cities on the shores of the bay are small when measured by the scale upon which Nature is building the Coast Ranges and some direction is needed by the stranger who has but little time to find the salient viewpoints from which to study the typical topography of the central California coast.

San Francisco Bay is itself both the evidence and the result of the local depression of this portion of the coast. The four mile ferry trip from San Francisco past Yerba Buena Island to Oakland or Berkeley is full of interest. The large area of deep water anchorage to the southward and the long San Francisco water front with its crowded wharves, tell something of the geographic advantages of the harbor, but in looking to the future it should be remembered that they are but a small part of the facilities afforded by the three hundred square miles of the bay. A fine view of the Golden Gate and the central portion of the bay is to be had in Berkeley from the buildings on the campus of the University of California and still better from the hills just east of the Greek Theater in which the Association holds its first meeting. The magnificent general view to be had from the slopes of these hills will convince the specialist that the bay is merely a valley submerged and filled by the influx of the sea through the former outlet—the Golden Gate. But even the novice in physiography who will go to the Presidio in the northwestern part of San Francisco and from Fort Point, on the southern shore of the Golden Gate, look northward to the Marin County hills, will see that their slopes to the very water's edge are those of the tops of hills whose bases rest far below the sea. A final view of the bay as a drowned valley is to be had on the trip to Mt. Tamalpais which rises sharply from shore line to over 2600 feet. A ferry boat carries the visitor from San Francisco northward across the bay past Alcatraz Island with its guns guarding the wide open Golden Gate to Sausalito, a town of picturesque homes clustered on the steep hillside. From here the electric cars which connect with the boat skirt an arm of the bay where newly made tidal lands meet abruptly the slopes of the submerged hills and finally stop at Mill Valley station. Choice can now be made of foot trail or of "the crookedest railroad on earth" to the top of Tamalpais from which may be seen a wonderful panorama of bay and ocean, of hills and mountains.

Viewed from the outlook station on the topmost crag, the branching arms of the bay outline the tributary gorges of the former valley. A slight exercise of constructive imagination will raise Tamalpais and the surrounding country some 300 feet to a former level and, in place of the bay, the Sacramento River will be seen winding its way along the now exposed floor of the valley in between Tiburon and the hill that a few moments before was Angel Island, and finally turning through the Gate-like pass westward to the Pacific. In descending the mountain no one should fail to take the side trip to the Muir Woods—the most accessible grove from San Francisco of the famous Redwoods, California's unique forest tree.

The foregoing facts indicate the formation of San Francisco bay by the sinking of the land, yet the California coast as a whole has been recently raised above the sea. One of the most popular of the tourist excursions is to a field rich in forms illustrating the evolution of coast topography, a locality where recent elevation is recorded with diagrammatic clearness. The eighty mile ride to Santa Cruz first along the western shore of the southern half of the bay, past Palo Alto and Stanford University, through the Santa Clara valley with its miles of orchards brings one to San Jose where if desired a stopover may be made for the stageride to the Lick Observatory the dome of which on the skyline of the eastern mountains is visible from the car windows. At Los Gatos the train leaves the open valley and crosses the Santa Cruz Mountains, winding upward through the narrow canons, plunging through the summit tunnel, and then downward by the Big Trees and along the wall of the canon of the San Lorenzo River to Santa Cruz on the shores of Monterey Bay.

The evidences of recent uplift are found along the coast to the northwestward. For the first ten or fifteen miles there is a magnificent series of old ocean terraces varying in height from rock cut shelves just above sea level to obscure weathered benches at an elevation of over twelve hundred feet. The three major terraces resemble the steps of some giant stairway with cracklike gorges incised by the main streams. On the gentle slope of the lowest great terrace—about 100 feet high and in places a mile wide—two lines of railroad run to Davenport. This trip gives a constantly changing view of the ocean and the present vertical sea cliff on the left, while on the right rises the old sea cliff of the second terrace—an escarpment softened by erosion and accumulation of talus. At intervals a bend in the road, especially on the trestles crossing the gorges, affords a fine view of three major terraces above at elevations of 250, 500 and 800 feet. If proof is needed that the fronts of these terraces are old sea cliffs, on reaching Davenport a climb should be made up the face of the bluff to the branch railroad that starts back into the mountains on the slope of the second terrace. As the road

reaches the front of the third terrace it turns into the canon of San Vincente creek. Here a fortunately placed railroad cut has opened the talus slope and revealed the base of the old vertical sea cliff with its sandy beach sloping seaward from its foot. Good exposures of fossil sea-cliffs are not so common but that the physiographer is well paid for the short mile walk from Davenport. Added evidence that this series of benches are old elevated sea strands may be had by leaving the railroad at the east end of the trestle crossing Laguna creek and walking up to the rear of the second terrace. A little search will show rock ledges outcropping in the grass and filled with holes bored by sea urchins and rock clams. These rocks are duplicated exactly in the tidal water at the foot of the sea cliffs of today.

While at Davenport there may be seen at the mouth of the creek low benches cut in the rock at the foot of the cliff. Similar forms in the vicinity testify to a recent uplift of some ten or fifteen feet. On the other hand some of the creeks crossed by the railroads three or four miles out from Santa Cruz have lagoons near their mouths and have evidently been recently submerged. These local alternations of uplift and depression probably have their extreme illustration in the depression which formed San Francisco Bay. The undulatory character of the general uplift is not extreme in amount when it is considered that terraces similar to the Santa Cruz series are found all along the coast from Mexico to Oregon wherever the rock is of a character to yield rather easily to the mechanical erosion of the waves and yet is fairly resistant to atmospheric weathering. The uplift indicated by the ocean terraces occurred in the physiographic yesterday. The active youth of the California coast today is best seen by taking the Ocean Shore R. R. from San Francisco southward about ten miles to Mussel Rock station. From this point the trace of the San Andreas Fault is so plainly expressed in recent topographic forms that it has been followed without interruption nearly 500 miles until lost in the sands of the Colorado Desert. An hour's walk along the fault zone is well repaid. There is still to be seen at intervals the crumpled sod along the fault plane between the portion of the earth's crust that moved to the northwest in 1906 and that which went to the southeast. Offsets in fences still bear testimony to the direction of the movement. Previous, but relatively very recent, activity in the same fault zone is indicated by the succession of ponds, small linear valleys, and low escarpments which mark the zone whether it follows the top of ridges, hangs on hillside slopes, or follows the floors of larger valleys.

Space has forbidden more than mere mention of the most interesting features of the trips suggested. A day each to Mt. Tamalpais and Mussel Rock, and two days for the Santa Cruz trip will cover the main points outlined and give some glimpses of the general topography of

this portion of the Coast Ranges. With the exception of the Mussel Rock trip these excursions may be taken with practically no walking and are full of scenic interest to every visitor while to the special student they furnish striking illustrations of the great forces affecting the California coast and of the types of topography being evolved.

NOTE.—The location of the minor places mentioned in discussing terraces will be found on the topographic map of the Santa Cruz Folio, U. S. G. S. The following topographic maps are useful for the bay region: Tamalpais, San Francisco, Concord, San Mateo, Haywards, and San Jose.

THE YOSEMITE VALLEY

By MABEL B. PEIRSON

Pasadena, California, High School

THE Sierra Nevada, seventy miles in width, falls steeply on its eastern edge by a fault scarp to the desert floor; but its western flank slopes gradually for many miles to the great valley of California. Midway on this western slope is sunk the valley of the Yosemite, eight miles long, one-half to one mile wide, and two-thirds of a mile deep. It is 140 miles easterly from San Francisco, and can now be easily reached by rail and stage.

The railroad takes us up the valley of the Merced through the gold-quartz belt to El Portal, at the boundary of the National Park; then we are carried by stage into the valley in a few hours, following a well built road which winds up the steep valley amongst gigantic talus boulders. The canyon grows wilder and deeper, the walls more precipitous. At last we catch sight of El Capitan ahead, and get a glimpse of Bridal Veil through the pines. Then the falls come fully into view, a beautiful, wistful, filmy veil of white, ever drifting as it drops into space from the cliff 620 feet above.

When we are torn from this enchanted spot, we find ourselves gazing in awe up the perpendicular face of El Capitan right into the sky. Nothing ever looked so high. It is 3,000 feet in height, as far as the valley is wide. This one face contains 165 vertical acres; while the rest of the cliff, forming a right angle with this, is more massive still. On the right we pass the Cathedral Peaks, not of such impressive size, but more beautiful, with their jutting crags and graceful spires piercing the sky and casting deep shadows on the cliff behind them.

The valley meanwhile has changed completely: just below, narrow and full of talus, here it spreads out a level floor, carpeted with ferns and flowers, and covered with a beautiful forest of pines, firs and oaks.

The azalea bordered Merced, below plunging tumultuously down the canyon, here meanders peacefully in broad curves and deep clear pools where one can see the trout at rest.

The Three Brothers appear on the left, shoulder to shoulder; while the Sentinel Rock stands on the right, like a giant watch tower over the little town. Here we find hotel, post office, and stores, and the military headquarters of the park. We have choice of several excellent camps; or if we bring camp equipment or wish to rent one, we apply at headquarters for a camp site, and are escorted by a guard to a lovely pine shaded spot on the river bank.

We hear ever the roar of the Yosemite, just behind the town, where it pours over the wall in a sheer drop of 1430 feet, then cascades for 600 feet, and makes a final leap of 320 feet into the valley. As we climb slowly up the steep trail nearby, it is wonderful to watch this stream hurl itself out into the air and plunge downward, an ever changing, swaying mass to the rocks far below. At night, around our camp fire, we watch the rain of fire down Glacier Point from the camp fire at the hotel above; and listen to the clear calls of the campers that come floating down. In the morning early, we walk up the valley through flowery meadows and forest paths, past the slender Washington Column and the Royal Arches, where great curved shells of rock have weathered off and fallen. Above is a rounded dome of granite; while to the right rises the remarkable Half Dome, rounded on the outer side, but perfectly vertical on the valley side, as though cut in two. Following Tenaya Creek to the left, we reach Mirror Lake, rock rimmed and motionless in the sunrise light; with the delta and the pines, the half dome and the upper canyon, lying pictured on its surface, broken only by the ripples caused by the fish as they rise.

A short walk up the Merced brings us to the point where it emerges from the Little Yosemite 1900 feet above, in two majestic falls of great volume, the Nevada and the Vernal. A remarkable feature of all the Yosemite falls is the small amount of erosion which they have accomplished. It is especially noticeable in the Vernal, which drops over a straight cliff, apparently not having notched it at all.

There are numberless interesting trips up to the rim of the valley with its domes; Cloud's Rest, a peak of nearly 10,000 feet; Mount Hoffman with its gems; May Lake, a glacial cirque; and everywhere one of the most beautiful forests of the world with the crowning glory of the Giant Sequoias.

The student of Geography finds everywhere fascinating subjects of study, and keeps asking how these marvellous forms could have been produced. The perfectly rounded domes of every size from small knobs up to mountains of 9,000 feet are a most characteristic feature of this region. Are they merely the more resistant rocks left by the spherical

weathering of granite? Or were they great masses of molten rock thrust up into the overlying sedimentary strata when these mountains were first upheaved, and fashioned into their present forms by weathering?

How could this great trench have been sunk over 3,000 feet into the Sierra granites? There are many valleys of erosion in the Sierras, but not with the flat floor and vertical walls of the Yosemite. Perhaps there was here a dropped fault block or rift; or probably many of them, as indicated by the cross fractures and right angles in the walls of the valley. The Half Dome must certainly have been split, and the inner half carried down. This theory seems to be well established in the case of the Kern River to the south; and might also explain the Hetch Hetchy valley to the north.

The tributary valleys have been glaciated, and are polished and grooved right to the rim; but the glacier in the Yosemite was probably never over 1,000 feet in thickness. There are medial moraines between the three streams at the head of the valley; the Tenaya has a slight terminal moraine; and the main terminal moraine stretches in a curved line from Bridal Veil to El Capitan. Below this last moraine, the valley is narrow and full of talus; above, there is little talus and the valley is broad and flat with fine soils. Probably the glacier removed the talus, and the moraine perhaps formed a lake dam, which would account for the level floor and fine soils. The 4,000 foot contour line surrounds the entire valley, and the El Capitan bridge near the bottom is only fifty feet below this.

One is impressed with the youthful stage of everything, the little talus, and the vertical walls. It does not seem long since the glacier was here. As one climbs eastward toward the crest, the impression grows deeper. Large areas of rock still shine with the glacial polish, and probably over the whole surface not more than an inch or two has weathered off since the glaciers passed. On Mt. Lyell, 17 miles eastward, there are glaciers still in existence.

A three weeks tramp with pack animals will easily include a visit to this mountain: the Mono Valley with its volcanoes and ancient lake beds; Mt. Dana and its glacier; the Tuolumne Meadow with the famous natural soda spring; and the Hetch Hetchy Valley, similar to the Yosemite. Or any of these places may be visited by a ride of a day or two on horseback.

One of the new industries of California is that of cotton growing. Imperial Valley, on the delta of the Colorado, bids fair to become an important cotton producing section. The first commercial crop was grown in 1909, when 600 bales of 500 pounds each were marketed. In 1910 the output amounted to 5,812 bales, grown on 6,000 acres.

THE SEQUOIAS

By T. P. Lukens

Pasadena, California

PRIOR to the Glacial Period, the Sequoias were widely planted over three continents, but now they are limited to small areas in California alone.

The Sequoia sempervirens, commonly known as Redwood, grows only along the west coast of California, from near the Oregon line southerly for about two hundred and sixty miles, and nowhere does it grow further than twenty-five miles from the sea; perhaps ninety-five per cent are growing within ten miles of the coast. At no place is it found at a high elevation.

The uses to which the lumber of the Redwood is put are known to all. It is the only conifer indigenous to California that will sprout from the stump. This adds much to its value as a forest tree. With reasonable care after harvesting in keeping out fire, a new forest will soon take the place of the old.

Teachers visiting San Francisco who so desire can have an object lesson on the wonderful power of reproduction by this tree at Mill Valley in Marin County. Here was the first lumbering in California; the first trees having been cut in 1835 and from that time on until 1860. And here will be found, close to the station in Mill Valley, a circle of sprouts; each tree about two feet in diameter and from forty to eighty feet in height, the third generation of what may have been the largest redwood ever known. I ascertained that this tree was cut in 1835, the first set of sprouts was cut in 1875, now there is twenty thousand feet of lumber in the third growth. There is no portion of the old tree left, it having decayed or been removed, but the circle is perfect and the diameter inside this circle is thirty-eight feet, so the tree was presumably thirty-eight feet in diameter at the ground. This and other wonderful trees can be seen about Mill Valley in an easy half day's trip from San Francisco, but make it a whole day and go on to Mt. Tamalpais and the Muir Woods. On this trip you will see several hundred giant trees not only Redwood but Douglas spruce and Chestnut oak, a sight well worth a trip across the continent. Muir Woods consists of two hundred and ninety-five acres of forest on the southerly slope of Mt. Tamalpais, and was the gift of William Kent to the United States as a Redwood preserve. It contains many grand specimens. Mr. Kent gave this valuable property to the United States Government with the understanding that it should be cared for as a park for the benefit of all and that it should be named for John Muir, our beloved mountain friend.

The State of California owns several thousand acres of redwood forest in the Santa Cruz mountains, which are easily reached in a day from

San Francisco. The quickest way to reach the State Park or Big Basin is via Los Gatos to Boulder City. From this point there is a stage ride of fourteen miles to the Governor's Camp, which is located under the grand old trees. If one can spend two nights and a day he will be richly rewarded. Here are:—several thousand trees, many of which are from fifteen to twenty-five feet in diameter and reaching far up into the sky; the Douglas spruce, a close second to the redwood, also magnificent oaks, azaleas and a beautiful carpeting of ferns and flowers. This trip, if you are at all a lover of God's wild gardens, will repay you for a trip around the world.

To see the big brother of the redwood, the Sequoia washingtonia or gigantia, one must travel further, for this tree grows only in the Sierra Nevada mountains. The most northerly grove contains but six trees, and is located on the Middle Fork of the American river, at about five thousand feet elevation in Placer County. These trees appear also on the westerly slope of the Sierra Nevada at from five thousand to eight thousand five hundred feet above sea level, and extend for a distance north and south of about two hundred fifty miles. Tulare County is their southern limit. The Bigtree Grove most accessible from the Bay is the Calaveras, or "Mammouth," which includes the South Grove or the Stanislaus, the first grove found, and this was discovered by John Bidwell in 1841. There are more very large trees in this grove than in any other. For this trip take ticket by rail to Sonora, Tuolumne County; stage fifteen miles; there is a good hotel.

If you can spend four or more days, go to Yosemite by rail, stage from Yosemite to Wawona. This is an easy one-half day stage ride through grand forest and mountain scenery to the South Fork of the Merced river. Wawona is one of the best, if not the best mountain resort in California. From the hotel you can ride in a comfortable carriage, or stage, or go on horseback to the Mariposa Grove. Upon the ride of about seven miles from the hotel to the Bigtrees you will wonder what they (the Bigtrees) can be, if they are larger than the trees you are passing; on every side are Sugar pine, Douglas spruce, White and Red fir, and Libocedrus, larger than any trees you have ever seen outside California; many from eight to fourteen feet in diameter and three hundred feet high; so in the climb from Wawona to the Bigtrees you are in a measure prepared for the inspiration you experience when in the presence of these monarchs who were witnesses to our blessed Savior's stay on earth. Now that you are with God's grandest production in the vegetable kingdom, tarry, for it takes time to fully realize their grandeur, then you will feel repaid many times for the trip, and thank God anew for His goodness.

Take a ball of twine with you, run around a big tree with the cord, take it (the cord) home with you, and unwind it in a company of friends

or in the presence of your pupils, and see their astonishment in learning that there is a tree growing that is so great in diameter.

If you visit Sequoia Groves further south, you will find natural reforestation at work, little hopefuls from one inch high to the monarchs, and you will find them growing over ridges and canons, never exclusively, but peacefully growing with other species of conifers and broadleaf trees, displaying no haughtiness because of their superiority over all the vegetable kingdom.

You can easily reach the more southerly groves from Fresno or Visalia, from the latter place, the General Grant Park.

If possible secure before you make the trip "Forest Trees of the Pacific Slope" by Geo. B. Sudworth, Dendrologist, issued October 1st, 1908, by U. S. Forest Service. Then no tree will be a stranger to you. If not able to secure this, take Sargent's "Manual of the Trees of North America," or any other work that describes all the trees, or Bulletin No. 28, Division of Forestry, "The Big Trees of California," or John Muir's "Mountains of California."

Seeing and knowing what you see, you will be stronger and better. Remember that you leave all danger of accident or sickness in the cities, so give no thought for your safety while in God's gardens and temples.

THE CALIFORNIA OIL INDUSTRY

By Ralph Arnold

Consulting Geologist and Engineer, Los Angeles, California

CALIFORNIA stands first among the states in the production and value of its petroleum. In 1909 it produced 56,910,449 barrels, valued at $34,856,126. In 1910 the estimated production was 75,000,000 barrels. Furthermore, oil is the most important mineral product of the State, outranking gold, its nearest competitor, by $14,000,000 in 1909.

The great bulk of California oil is not like that from the eastern and midcontinent fields. It has what is termed an asphaltum base and is better suited for fuel purposes than is the lighter, paraffine-base oil from the east, which is largely of a refining grade; only about 20 per cent of the California product is suitable for refining.

Again, the petroleum in California occurs in rock formations much younger, geologically speaking, than those yielding the oil in Pennsylvania, Ohio, Illinois and Oklahoma. The oil here occurs in the Tertiary while in the east it occurs in the Paleozoic rocks.

The source of most of the California oil is diatomaceous shale, a rock made up largely of diatoms, a microscopic aquatic plant having a siliceous or quartz shell with a filling of chlorophyll. In some of the oil fields of the State formations made up very largely of the remains of diatoms attain a thickness of over a mile.

In addition to a source for the oils there are two other prerequisites for an oil field. One is a porous bed in which the oil can accumulate and the other is an impervious layer over the porous bed which will prevent the escape of the oil. In practically all of the California oil fields the reservoir is a sand bed which is overlain by a dense shale or clay "cap rock." The diatomaceous beds and the sand and shale layers are largely of marine origin, as is attested by the finding of sea shells and sharks teeth in many of the strata. It is not uncommon to find perfectly preserved teeth and shells in the sand which comes out of the wells with the oil in certain of the fields.

The oil fields of the State may be divided into two natural groups, those lying along the edge of the southern part of the great interior basin—the San Joaquin Valley—and those which are scattered through the coast ranges of the southern part of the State.

Among the former are the Coalinga, Kern River, Sunset, Midway and McKittrick districts which yield by far the greater part of the petroleum of the State. Their product is mostly fuel oil. The oil-bearing beds in these districts lie for the most part in great monoclines or "blankets" which pitch gently off from the flanks of the encircling ranges under the floor of the great valley. These districts were first disclosed by the outcropping oil sands along their edges. The greatest well in the world, the Lake View "gusher," is situated in one of these districts—the Sunset—which in common with the Midway is noted for its great flowing wells. The Lake View well began flowing March 15, 1910, and during the first year of its life produced between seven and eight million barrels of oil and is still flowing. Its maximum daily yield was 68,000 barrels.

The oil districts on the outer flanks of the Coast Ranges comprise the Santa Maria, Summerland, Santa Clara Valley (Ventura County) Los Angeles and Puente Hills districts. Most of the refining oil of the State comes from these districts. In them the oil-bearing rocks lie in great anticlines or arched folds, in the apices of which the oil accumulates. One of the most interesting of these districts is the Summerland, in which the oil comes from wells sunk from wharves built out into the Pacific Ocean.

California oil has supplanted coal as fuel throughout practically all of the Pacific Coast States, and is largely used also in Arizona, Nevada, Alaska, Hawaii, Panama and Chile. It runs all of the railroads and a large number of steamers, is utilized for gas and manufacturing in the

cities, furnishes the power in many mines, pumps the water for the Hawaiian sugar plantations, operates the railroads and nitrate deposits of Chile, digs the Panama Canal, and is, in fact, the life of the industrial Pacific Coast. It has gained its important position rapidly and from what is known of the permanency of its supply will hold this position for many years to come.

THE RAISIN INDUSTRY IN CALIFORNIA

By Edna E. Rowell

Fresno High School

ALTHOUGH grapes of various kinds are grown in many parts of the United States, the raisin industry is limited to California. Twelve counties in this state produce raisins, but about ninety per cent of the output comes from Fresno, Kings, and Tulare Counties—Fresno county alone producing over sixty-three million pounds a year, which is sixty per cent of the crop of the state and nearly twice as much as the crop of Spain. These counties are in the central part of the San Joaquin valley with the high Sierra Nevada mountains on the east and the Coast Range on the west.

The soil of this valley is alluvial in nature, but the chemical composition as well as the physical characteristics vary greatly in different localities. In some places it is a rich black soil, in others a red clay, and in others a gray clay, but throughout the whole region sand is found in greater or less quantity. The mixture of these soils known as the California sandy loam is the best for the production of the raisin grape, as besides having the proper food constituents it is well drained and gives a dry surface on which to lay the trays while the grapes are drying.

Fresno City, the commercial center of the raisin industry, has an elevation of three hundred feet. The whole region slopes gently toward the west, draining into the southern part of the San Joaquin River and is so level that the conditions for irrigation are ideal. There are two sources of water supply for this irrigation. The one which has been used the longest is the water from the Kings and San Joaquin Rivers which have their sources in the perpetual snows of the Sierras, and the other which is being used more and more is an apparently exhaustless underground reservoir which is tapped in some places by artesian wells and in others by pumps.

The climate of this district is temperate in all respects. The temperature ranges from freezing, or an occasional exterme of twenty-four degrees Fahrenheit in December and January, to a maximum of one hun-

dred ten to one hundred fifteen degrees in July and August. The rain fall is such that on many rain charts of the world the valley is classed as a desert—the yearly average being between nine and ten inches, although there has been as much as sixteen and one-half inches and as little as four and three-fourths inches for a season. This lack of rain does not interfere with the crops however, as water for irrigation can always be had.

The first rain in the autumn comes about the middle or last of September but is only a shower, the first real rain being in October, in which month there is usually one-half inch or a little more of rainfall. The heaviest rains are in January, February and March with light rains in April and a few showers in May which seldom total more than a quarter of an inch. June, July and August have no rain at all, or if they do, it comes as local showers which effect districts of a few acres only. This lack of rain and a consequent lack of dew during these five months explains why it is possible to dry fruit and grapes in such quantities and to such perfection in this valley.

Grape vines are started from cuttings which usually have six buds to a cutting and in bundles of one hundred are placed in sandy soil to root. It is these "rootings" that are generally used in planting vineyards although cuttings are sometimes used. A vineyard will pay for the cost of caring for it in the third year and in the fourth year will produce a full crop. There seems to be no age limit for grape vines as some after fifty years are still good producers.

The work on a vineyard is no harder than the work on other kinds of farms. The vines are pruned during the winter—from December fifteenth to February fifteenth being the best time. The extent of the pruning depends on the kind of grape. Sultanas and Thompsons, which are the two varieties of small seedless grapes used for drying, are pruned so that stems three or four feet long are left which are tied up to stakes so the vines are held up from the ground. The Muscats and Malagas, which make the regular raisins of commerce, are pruned very much shorter—some leaving only two or three buds to a stalk and four or five stalks to a vine, while others leaving the same number of stalks to each vine have six or seven buds to each stalk.

After the pruning is finished the vineyards are plowed. Of recent years some farmers have tried the experiment of putting this off until the last of March or the first of April so that there might be more of the wild plants to plow under to serve as a natural mulch. In the middle of April the vineyards are irrigated. This is done in two ways—the best and most common way is to run the water in furrows between the rows of vines, the other is to flood the whole vineyard. Unless the season is very dry, or it is a young vineyard, one irrigation is all that is required, and where the water table is high none is needed. After this the vineyards

are again plowed, cultivated and cleared of all weeds and then require no more attention until about August twenty-fifth.

At this time the grapes are ripe and ready to be shipped, made into wine or dried. To make raisins of the grapes they are cut from the vine and placed on wooden trays. These trays are made of one-fourth inch lumber and are two by three feet in size holding about twenty pounds of fresh grapes. The work of picking the grapes is done by men—many of them picking as many as two hundred trays in a day. These trays are placed in the open where the grapes can get the full benefit of the sun's rays for the whole day, and in about ten days the tray will look as though it were covered with raisins. This is not the case however, as only those grapes on top have dried, and to give those underneath a chance to dry, they have to be turned. This is done by placing a tray over the top of the grapes and then two men pick up the two, turn the whole thing so that now the second tray is on the bottom, the dried grapes are on it and those which are not dry are exposed to the sun. Two men can "turn" the raisins from a twenty acre patch in one day or a little more. After ten days more the grapes are all dried and they are now slipped from the trays into larger boxes known as "sweat boxes" in which they are taken to the packing houses to be packed, seeded or stemmed as the case may be.

In the packing houses much of the work of packing and all the work of stemming, seeding and boxing is done by machinery so that the finished product has really been touched by hands just once—when it was taken from the vines and since then they have had twenty days disinfecting by the sun. This gives a very much cleaner product than any other method of curing raisins, such as the method of dipping in lye and then putting on the sand to dry as is still done in some parts of Spain.

The food value of raisins is very high as they contain over sixty-three per cent carbohydrates and nearly five per cent protein besides ash, fat and water. This means that although raisins are often thought of as a confection, a pound of them has the same food value as either four and one half pounds of potatoes, four pounds of milk, two pounds of eggs, one and a third pound of beef or a one pound loaf of bread. It is also interesting to know that although Great Britain has to import all her raisins they are used there in the ratio of five pounds per year to each person, while the United States, the greatest raisin producing country in the world, uses only one and one-half pounds per capita.

The conditions in Imperial Valley are especially favorable to cotton growing, as there is an abundance of water for irrigation, no rains during the season when the crop is maturing, no early frosts, and on account of extreme dryness of the atmosphere, the boll wevil does not develop.

THE GEOGRAPHICAL DETERMINANTS OF LOS ANGELES

By W. H. SNYDER

Principal, Hollywood High School

MANY factors enter into the upbuilding of a great city but among the most important of these is the geographical. The growth and development of Los Angeles has been peculiarly due to its geographical environment. When the Spaniards first landed on the shores of Southern California and explored the fertile plain embraced between the mountains and the sea, they found a large Indian village, Yang-na, occupying a part of the present site of Los Angeles. Abundance of water, the wooded banks of the stream, and the rich alluvial soil attracted the aborgines as they did afterward the European settlers. In 1777 Governor Filipe de Neve travelled from San Diego to San Francisco for the purpose of determining the best sites for pueblos where grain could be raised to supply the military establishments. The one in the south he located at Los Angeles and on Sept. 4th, 1781, it was formally founded. The size of the present city attests to the wisdom of Governor Neve's choice.

Water, soil and agricultural possibilities were however only the initial factors in the upbuilding of the city. Los Angeles, like Paris and Vienna, lies at the intersection of natural trade routes. In early times *El Camino Real,* or the Royal Road between San Diego and San Francisco, passed through Los Angeles in order to cross the Cahuenga Pass and was there joined by the roads from San Pedro Harbor and the broad valley south of the San Gabriel and San Bernardino mountains. Later the Spanish Trail leading from the Great Basin region and the East found its outlet to the sea through Los Angeles. Thus even before the advent of railways the topography of the surrounding country had diverted the trade not only of the coastal plain but of a large interior region to this point and made it the distributing center for a large area.

In 1869 the first railway of this south-western region was constructed between Los Angeles and its port, San Pedro. This greatly reduced the carriage charges between the city and the harbor and increased its commercial importance. There were no engineering difficulties in the construction of this road as the distance is short and the plain is nearly level. The harbor has since become a part of the city proper, and is one of the best on the Pacific Coast. When, however, the construction of a trans-continental railroad was contemplated, the high mountain ranges which so closely border the western coast seemed to offer almost unsurmountable barriers. To the north the mountain passes were too high, and at the south the deep gorge of the Colorado river blocked the way.

The old Gila river trail which crossed the Colorado river at Yuma offered the easiest route. Although this trail had its western terminus at San Diego yet it was found much less expensive to build the railway through the San Gorgonio Pass and along the foot of the San Gabriel mountains than to attempt to reach the sea at San Diego. Thus the railway was naturally deflected to Los Angeles. To the north the Soledad Canyon offered almost the only exit from the plain across the mountains into the Mojave valley and from there through the San Joaquin to San Francisco.

The valley of the Los Angeles river is the only practical route from the south to this pass and thus the railway was turned to Los Angeles making it the juncture of the northern and eastern roads. The only other pass by which roads from the east and north-east can reach the south-west coast is by the Cajon Canyon north of San Bernardino but from here the most direct and practical line to the coast is through Los Angeles. The Southern Pacific, the Santa Fe and the Salt Lake railways cross these passes. From the Mojave Desert at the north of these canyons, outlets can be found eastward through Santa Fe and north-eastward through Salt Lake. Thus Los Angeles through its situation became a natural center for the railways connecting the west and southwest coast to the rest of the country. Over the plain west of the mountains a network of steam and electric railways centers upon the city and brings to it their traffic.

But a city to grow large must not only be a center of lines of trade, it must also have a back country which is highly productive of commodities suitable for commerce. Although the territory immediately contributory to Los Angeles is not large in extent, yet its capabilities for productiveness are probably unsurpassed by any equal area. The streams descending from the mountains furnish abundant water for irrigation and because of the large alluvial fans they have built and over which they flow have not only made irrigation remarkably easy but have produced a soil unsurpassed in fertility. The seedless orange, introduced by the government in 1874, supplied a crop peculiarly adapted to the region and capable of the most intensive cultivation, and of producing the greatest pecuniary rewards. When to the oranges are added the lemons, the grapes and the deciduous fruits, the value of these crops equals that of vastly greater areas in other parts of the world. As these fruits are mostly exported and the less intensively cultivated crops and many manufactured articles are imported the amount of trade carried on at the commercial center is unusually large. In addition to these agricultural products the vicinity of Los Angeles is rich in petroleum which not only furnishes cheap fuel and power for manufacturing but gives employment for a large number of men. Because of the advantage of inexpensive power manufacturing is extensively carried on.

Another great asset which Los Angeles possesses, and in which it is

equaled by no city in the world, is its transitional sub-tropical climate. Situated as it is on a western coast with lofty mountains to the east and at the border between the source of the Trade Winds and the Prevailing Westerlies, it has a climate unsurpassed by any locality. In winter the stormy winds of the temperate zone predominate, bringing rain, and in the summer the sub-tropical calms bringing almost continual sunshine. The average percentage of sunshine for the year is 75 per cent. The temperature rarely reaches the freezing point in winter and never becomes excessively hot in summer. The climate is neither monotonous nor rigorous, enervating nor oppressive. The mean temperature of the three winter months is about 55 and of the three summer months about 70 degrees. This is a region of equable temperature, of plentiful but not excessive sunshine, of limited but sufficient rainfall.

Conditions like these could not fail to attract to Los Angeles an energetic, enterprising and progressive class of people. The natural advantages have been seized upon and nature and man have worked together to produce a city destined to become one of the great cities of the earth, the health, prosperity and happiness of whose inhabitants will be unsurpassed.

LAKE TAHOE, CALIFORNIA-NEVADA

By George D. Louderback
University of California

ON ACCOUNT of the interesting phenomena which it presents to students of physiography, together with the beautiful scenery and the ease with which it may be reached, Lake Tahoe probably offers the most attractive side trip that can be made by those who travel by the Central or "Ogden" route.

Lake Tahoe lies in the summit region of the Sierra Nevada. Approaching it from the south the crest line of the Sierra forks into two ridges, one passing to the east of the lake and the other to the west. The peaks on both sides vary in altitude from about 8,000 to 10,000 feet. The surface of the lake stands at about 6,225 feet. Its length in a north-south direction is 21.6 miles and its extreme width about 12 miles.

The mountains to the west of the lake rise abruptly at the average rate of 1200 to 1500 feet per mile. They are rugged and the peaks are well aligned into a typical sierra.

The mountains to the east rise with more gentle slopes and viewed from the lake have not the ruggedness nor the varied scenic elements of the western ridge. For these reasons they give the false impression that they are lower. Viewed from the east they also are precipitous and ap-

pear like a mighty wall rising 4500 feet above the Carson valley with a massiveness and continuity not shown by the western ridge.

The two ridges are alike in that their slopes are asymmetric, and the steeper slope of each is to the east. Their difference in appearance as seen from the lake is due in part to the fact that we face the more precipitous slope of one and the gentler slope of the other, in part to difference in rainfall—the western ridge having the higher precipitation and therefore subject to more erosion.

This climatic difference was most effectively displayed in the glacial period. Then the western ridge supported a considerable number of glaciers, several of which came down far enough to enter Lake Tahoe. The glaciers on the eastern ridge were smaller and much less important. The difference is strikingly shown on the map by the great abundance of glacial lakes in the west side mountains and their scarcity to the east. A wonderful view of a large number of these lakes and of various other topographic forms characteristic of glaciation may be obtained from the summit of Mt. Tallac 3550 feet above the lake.

One of the most charming qualities of Lake Tahoe, especially on a bright summer day, is its wonderful deep blue color. This color is dependent on the purity and depth of the water. In a few spots where the water is moderately shallow, particularly in Emerald Bay, a fine green color is obtainable. If still shallower, the water appears crystal clear and objects on the bottom are distinctly visible at 120 feet or more in depth.

A sounding of 1645 feet makes Tahoe the second deepest lake in America, the premier being Crater Lake in Oregon. This great depth accounts for the fact that while the lake is snow bound during the winter months—there were 16 to 18 feet of snow standing on the level at one time during part of this last winter—Lake Tahoe never freezes over.

Of considerable interest to the physiographer is the origin of the basin in which Lake Tahoe lies. Many points in its development have not yet been clearly worked out, but it is essentially a structural depression and its present form has been chiefly determined by faulting.

Two major north-south fault lines are inferred, one on either side of the basin. These lines can apparently be recognized for many miles to the north and include between them another remarkable depression called Sierra Valley.

The outlines of the history can best be expressed with reference to the general history of the region. During and following the Cretaceous the old range of folding that occupied approximately the present Sierra Nevada region was subjected to a long period of active erosion which reduced the country to a peneplain. Residual summit peaks of moderate height occupied the present Tahoe region.

According to Lindgren, faulting along the lines above described set in before the great Tertiary volcanic period. If so it did not progress very

far before the period of active eruption opened. Large areas to the north and west of the lake, including Mt. Pluto, Tinker's Knob, and the greater part of the walls of the Truckee River canon between Truckee and Lake Tahoe are now occupied by andesites produced during this period.

Following this, the Sierra Nevada was elevated practically as a tilted block, the peneplain surface being tilted toward the west, the fault scarps forming the eastern slope of the range. Good views of the tilted peneplain may be obtained from the train on the line between Blue Canon and Colfax. At Cape Horn can be seen the deep cut of the American River brought into activity by the elevation of the region. And between Dutch Flat and Gold Run may be seen, exposed by hydraulic mining, the gravels of an old Tertiary river that flowed over the peneplain in the days before its elevation and dissection.

In the vicinity of Lake Tahoe several lines of fracture formed. The main body of the mountains was lifted along a fault to the west of the lake, and the Carson Range forming the eastern boundary of the Tahoe Basin was elevated along a fault on its east side producing the great scarp already described. Another fault developed on its western side allowing a body of land between the two ranges to settle down unevenly—the Tahoe-Sierra Valley belt. The deepest depression of this belt formed the Tahoe Basin which in time filled with water and overflowed to the north and its outlet, the Truckee River, gradually cut a canon and lowered the surface of the lake.

Later on, basalt lavas flowed into the Truckee Canon and again raised the lake level. These basalts, now dissected, can be seen in the canon on the way to the lake—as at the "Devil's Playground"—and similar flows are easily seen from the train between Boca and Truckee.

In the meantime the glaciers were developing and the fault scarps were cut into and degraded, cirques formed, and morainal deposits brought down to the lake and into the Truckee canon. Fine examples of terminal and lateral moraines occur about Tellac and Emerald Bay. Some of the higher shore lines of Lake Tahoe are also easily recognized, especially along the west side and near Fallen Leaf Lake. On the retreat of the glaciers the country assumed its present condition.

That the faulting action has not entirely ceased is evidenced by a very recent scarp traceable for miles along the east base of the Carson range.

EDITORIAL—THE NATIONAL EDUCATION ASSOCIATION.

The meeting of the National Education Association in San Francisco, July 8—14, 1911, will furnish an excellent opportunity to see something of the western part of our country. A rate of one fare for the round trip has been announced by the transcontinental lines of railway. Stop-overs may be obtained both going and returning, and the privilege of going by one route and returning by another has been granted.

By taking advantage of the first dates on which tickets will be sold, the going trip can be planned to include a visit to the Petrified Forest near Adamana, Arizona, and the Grand Canyon of the Colorado. The Canyon is easily reached by a branch line from Williams, Arizona. A stop-over of one day at Adamana, and two or three days at the Canyon, will give the visitor a good idea of these wonders. This would leave time to see something of Los Angeles and vicinity before going to San Francisco. Instead of this route, the going trip might be by way of the Royal Gorge, Denver, and Great Salt Lake.

On payment of $15.00 in addition to the one fare, one may return by way of Portland, the Puget Sound country, and Yellowstone National Park. A stop of six days at the Park enables the visitor to take the regular stage tour, which is a trip that will always be remembered with pleasure. If you are especially interested in glaciers, return by way of the Canadian Pacific, stopping at Laggan, Glacier and Banff. The glacier of the Illicillewaet can be reached by a forty-five minute walk from the station at Glacier, British Columbia.

No teacher, and especially no teacher of geography, can afford to miss the joy, the inspiration, the culture and the added teaching power that travel confers. Attend the meeting of the National Education Association this summer, and see how your conception of the extent, resources and development of this country will expand. The trip will store your mind with beautiful pictures, and increase your efficiency as a teacher, as nothing else can. J. F. C.

BOOK NOTICE

A Little Journey to our Western Wonderland (California). A book of 222 pages to be used as a supplementary reader in the intermediate and upper grades of the grammar school. By Felix J. Koch. Revised by George W. James. Published by A. Flanagan Company, Chicago, 1911. Price 50 cents.

This is the most recent of the supplementary readers dealing with one of our most interesting states. The book is excellently illustrated and written in a style which ought to appeal to children. The type is large and clear and the selection of material is good. Some of the topics treated are Our First Chinatown, Residential Los Angeles, Raising Ostriches in California, Beautiful Pasadena, The First View of the Pacific, The Shell Industry of the Pacific, A Camp in the Sierra Madres, The Mt. Wilson Observatory, Venice in California, San Gabriel—A Bit of Old Spain, The American Rotterdam, San Diego, Mexico's Most Northwestern Town, Harnessing the Tides, The Santa Clara Valley, Oil Taken from the Sea, The Big Trees, The Largest Seed Farm in the World, Leland Stanford University, the City of the Golden Gate and its Neighbors.

GEN. LIBRARY, UNIV. OF MICH., JUN 6 1911

CALIFORNIA NUMBER Under the editorial direction of James F. Chamberlain.

The JOURNAL of GEOGRAPHY

VOLUME IX *JUNE, 1911* NUMBER 10

A MONTHLY MAGAZINE Devoted to the Interests of Teachers of Geography in Elementary, Secondary and Normal Schools.

RAY HUGHES WHITBECK, *Editor*

LAWRENCE MARTIN, *Associate Editor*

Of the Department of Geology and Geography of the University of Wisconsin.

CONTENTS FOR JUNE

		Page
Geographical Influences in the Development of California,	—*JAMES F. CHAMBERLAIN*	253
Topographic Environment of San Francisco,	—*RULIFF S. HOLWAY*	261
The Yosemite Valley	*MABEL B. PEIRSON*	265
The Sequoias	*T. P. LUKENS*	267
The California Oil Industry	*RALPH ARNOLD*	270
The Raisin Industry in California	*EDNA E. ROWELL*	272
The Geographical Determinants of Los Angeles,	*W. H. SNYDER*	275
Lake Tahoe, California-Nevada	*GEORGE D. LOUDERBACK*	277
Editorial—The National Education Association		279
Book Notice		280

AUTHORS ARE PERSONALLY RESPONSIBLE FOR OPINIONS AND STATEMENTS EXPRESSED IN *THE JOURNAL*

$1.00 A Year **THE JOURNAL OF GEOGRAPHY** 15c. A Copy

— PUBLISHED BY —

The Journal of Geography Company, Madison, Wis.

Entered at the Post Office, Madison, Wis., as second class mail matter Sept. 9, 1910.

THE JOURNAL OF GEOGRAPHY

Published Monthly except July and August

Successor to the Journal of School Geography, Vol. V, and the Bulletin of the American Bureau of Geography, Vol. II.

Editor.
RAY HUGHES WHITBECK.

Associate Editor.
LAWRENCE MARTIN.

Of the Department of Geology and Geography, University of Wisconsin.

Contributing Editors, 1910–12.

ISAIAH BOWMAN, Assistant Professor of Geography, Yale University.

JAMES F. CHAMBERLAIN, Professor of Geography, State Normal School, Los Angeles, Cal.

W. N. CLIFFORD, Southern High School, Philadelphia, Pa.

GEORGE E. CONDRA, Professor of Geography, University of Nebraska.

RICHARD E. DODGE, Professor of Geography, Teachers College, New York.

WILLIAM M. DAVIS, Professor of Geology, Harvard University.

PHILIP EMERSON, Principal Cobbet Grammar School, Lynn, Mass.

N. M. FENNEMAN, Professor of Geology, University of Cincinnati.

WILLIAM M. GREGORY, Professor of Geography, Normal School, Cleveland, O.

J. PAUL GOODE, Associate Professor of Geography, University of Chicago.

MARK JEFFERSON, Professor of Geography, State Normal College, Ypsilanti, Mich.

EDWARD M. LEHNERTS, Assistant Professor of Geology and Geography, University of Minnesota.

CHARLES A. McMURRY, Professor of Psychology and Pedagogy, State Normal School, De Kalb, Ill.

EDWARD VAN DYKE ROBINSON, Professor of Economics, University of Minnesota.

WILLIAM J. SUTHERLAND, President State Normal School, Platteville, Wis.

RALPH S. TARR, Professor of Physical Geography, Cornell University.

ROBERT DeC. WARD, Professor of Climatology, Harvard University.

Contributing Editors for Great Britain and Canada.

A. J. HERBERTSON, Reader in Geography, Oxford University.

JOHN A. DRESSER, Canadian Geological Survey, Ottawa, Canada.

RULES OF PUBLICATION:

Price—The subscription price is one dollar a year, payable in advance. Fifteen cents a copy.

Postage is Prepaid by the publisher for all subscriptions in the United States, Hawaiian Islands, Philippine Islands, Guam, Porto Rico, Tutuila, Samoa, Canada, and Mexico. For all other countries in the Universal Postal Union add forty cents for postage.

Change of Address—When a change of address is ordered, both the new and the old address must be given The notice should be sent ten days before the change is to take effect. Subscribers who fail to give notice of change are responsible for payment for all copies sent until notice is received. The post-offices do not forward second-class mail matter. Subscribers who do not observe this rule will not be sent duplicate copies.

Discontinuances—If a subscriber wishes his magazine discontinued at the expiration of his subscription, notice to that effect should be sent direct to the publisher, never to an agent. Otherwise it is assumed that a continuance is desired. Do not ask the publisher to discontinue your subscription without paying all arrearages.

How to Remit—Remittance should be sent by Check, Draft, Express Order, or Money Order, payable to order of The Journal of Geography. It is, as a rule, safe to send a dollar bill without registering, but sender must assume the risk. Larger amounts should not be sent in cash.

THE JOURNAL OF GEOGRAPHY

University of Wisconsin, Madison, Wis.

Globe-Wernicke Individual Libraries

To the idea of the individual library in the home the Globe-Wernicke plan of

Unit Construction

lends itself most successfully, making it possible for one to really enjoy books without risk of interruption or without interfering with the pleasure of others.

Easy to Arrange and Re-arrange

as new pieces are added or different settings desired, new and artistic combinations are quickly and easily created, as exact duplicates of our bookcase units are always obtainable.

Globe-Wernicke "Elastic Bookcases" are made in different styles and many different finishes to harmonize with appropriate interior fittings.

Carried in stock by nearly 1,500 agents, but where not represented, we ship on approval, freight paid.

Address Dept. J. G. for catalogue illustrated in colors and copy of **"The World's Best Books."**

The Globe-Wernicke Co.
Cincinnati, U.S.A.
New York Boston Chicago Washington

HAMMOND'S
NEW ATLASES AND MAPS
with 1910 Census
and all details brought down to date

are rapidly gaining appreciation and esteem in the minds of discriminating users. The line includes all sizes and prices, from the compact Pocket Atlas of the World at 25 cents, up to the most complete and comprehensive Commercial and Library Atlas of the World, of nearly 500 large pages, at $9.00. Sample pages mailed on request.

Our **Comparative Series of Large School Room Maps** contains thirteen large scale wall maps with physical features especially prominent, bold lettering, uniform scales, and equivalent projections used.

Our **Political Series of School Room Maps** are made in two sizes, the larger (68"x54") having sixteen maps, and the smaller (43"x36") nine maps; all are copper plate engravings, have mountains in brown, and political boundaries delicately tinted; lettering bold, and important details carefully edited.

Globes of all Sizes and Kinds Catalogue free

C. S. Hammond & Co. Publishers and Importers
142 Fulton St., New York

AN ALL-KNOWING SPECIAL TEACHER

ONE VOLUME containing the *pith* and *essence* of an authoritative library covering

Agriculture
Abbreviations
Architecture
Art
Astronomy
Bacteriology
Botany
Chemistry
Christian Names
Economics
Electricity
Fiction
Foreign Phrases
Forestry
Geology
Golf
Heraldry
Law
Mathematics
Mechanics
Medicine
Meteorology
Military Terms
Mineralogy
Mining
Music
Mythology
Nautical and Naval Terms

You are asked daily all kinds of questions. Where do you seek the final answers?

WEBSTER'S NEW INTERNATIONAL

THE MERRIAM WEBSTER

A New Creation, contains just the accurate, encyclopedic, up-to-date information you need.

Editor in Chief, W. T. Harris, Ph. D., LL. D., former United States Commissioner of Education.

400,000 Words defined. More than ever before appeared between two covers.

The only dictionary with the new divided page, "A Stroke of Genius."

6000 Illustrations. 2700 Pages.

An Encyclopedia. Type matter equal to a 15 volume set.

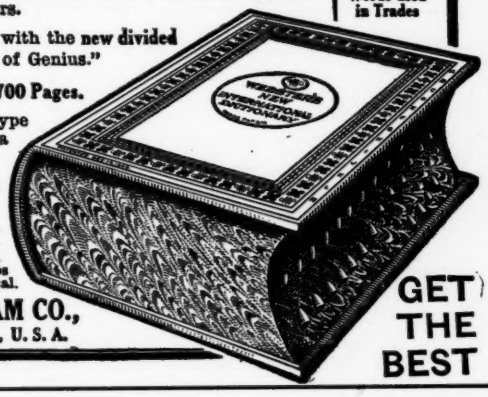
He Who Knows Wins Success.

WRITE for specimens of the new divided page, testimonials, illustrations, etc. FREE, a set of pocket maps if you mention this periodical.

G. & C. MERRIAM CO.,
SPRINGFIELD, MASS., U. S. A.

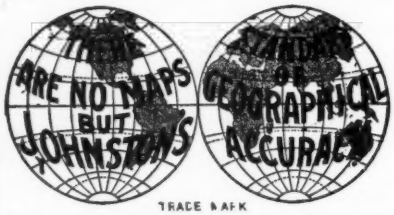
INCLUDES every field of the world's thought, action, and culture.

Philippine Island Words
Philosophy
Physics
Religious Terms
Scripture Names
Synonyms
Zoology
Biology
Geography
Words used in Trades



GET THE BEST

W. & A. K. Johnston's Maps & Globes



ARE

Guaranteed Absolutely Accurate
Always Kept Revised to Date
Colors Warranted Not to Fade

SEND FOR LARGE COMPLETE CATALOG

A. J. NYSTROM & CO., 86-88 Lake St., Chicago

SOLE UNITED STATES AGENTS

17---YEARS OF FRYE---17

1899---1916

The Indiana State Board of Schoolbook Commissioners at their meeting May 15th, 1911, after a contest extending over two years and entered by every publisher of school geographies, adopted for use in all the schools in Indiana for a period of five years

FRYE'S LEADING FACTS OF GEOGRAPHY

No other textbooks in geography are authorized for use in the Indiana schools.

Frye's Geographies were first adopted in Indiana in 1899.

GINN AND COMPANY

2301 PRAIRIE AVENUE **CHICAGO**

WOULD YOU LIKE TO SEE

The Yosemite, The Big Trees, The Many Vacation Resorts of California and Rebuilt San Francisco?

You can do so at comparatively small cost if you attend the National Education Association Convention in San Francisco, July 8—14, 1911.

(Printed by request of the National Education Association).

Geographical Lantern Slides

Designed by

Professor D. W. Johnson of Harvard University

for use by teachers of geography and geology

Each slide reproduces a photograph and a contour map of the same topographic feature, the map being so oriented (except in one case) that its bottom is the foreground of the photograph. The slides are intended to familiarize students with contour representations of land forms, as well as to illustrate the land forms themselves.

The price is $25.00 for the complete set of 40 slides.

Inquiries regarding sale and all remittances should be addressed to Professor W. H. Lawrence, Massachusetts Institute of Technology, 30 Trinity Place, Boston.

Send postal for free descriptive catalog

LANTERN SLIDE CABINETS

Quartered Oak, 6 Drawer Cabinet. Capacity 1200 Lantern Slides. Price $25, F. O. B. High Point, N. C.

Quartered Oak, 8 Drawer Cabinet. Capacity 1600 Lantern Slides. Price $28.50 F. O. B. High Point, N. C.

The capacity of each drawer is 200 slides. Drawers are divided into five compartments with 40 grooves to a compartment.

Manufactured by

P. W. COBB,

HIGH POINT, N. C.

IMPORTANT TOPICS IN GEOGRAPHY

A series of pamphlets, by Douglas C. Ridgley, Professor of Geography, Illinois State Normal University, Normal, Illinois, on **Important Topics in Geography,** which can not receive adequate treatment in the usual text books because of the limited space it is possible to allot to them in such books.

They are written with the express purpose of making them helpful to the pupils in the geography classes of the grammar grades and to the pupils studying physical and commercial geography in the high school.

They are intended as a help to, not a substitute for, the regular text book work. They aim to state certain principles of geography so simply and comprehensively that the study of them will enable the pupil better to see the broad relationships existing in geography. They will be found especially valuable in the study of the world, or any continent, as a whole.

GENERAL CIRCULATION OF THE ATMOSPHERE.....15c.

The topic treated in this pamphlet is fundamental to any causal study of the geography of the world so far as it deals with the amount and distribution of rainfall and its consequences; namely, vegetation, animal life, distribution of population etc.

RAINFALL OF THE EARTH.....15c.

This pamphlet treats of the rainfall of the whole earth in its relation to wind belts and physical features, and then makes a more detailed study of the rainfall of Africa, to indicate how the topic may be dealt with in the study of a single continent.

VEGETATION ZONES OF THE EARTH.....15c.

This pamphlet classifies the vegetation zones, gives the characteristics of each, their geographical distribution and their value to man.

TRIP AROUND THE WORLD ON THE FORTIETH PARALLEL OF NORTH LATITUDE .....10c.

The study of this pamphlet will give a vividness and reality to the pupil's conception of the earth as a whole, and to his idea of place relations on the surface of the earth not readily obtainable in any other way.

SPECIAL NOTICE

These four pamphlets will be sent postpaid to any address for 50c. Ten or more copies, assorted as desired, will be sent postpaid and a discount of 20 per cent. from list prices, allowed.

McKNIGHT & McKNIGHT Publishers, Normal, Ill.

KEYSTONE LANTERN SLIDES AND STEREOGRAPHS

PHYSICAL GEOGRAPHY AND GEOLOGY

14757—One of Japan's Largest Modern Silk Weaving Plants

Edited and described by
Dr. W. W. ATWOOD—University of Chicago
—And—
JANE PERRY COOK—Chicago Normal School

KEYSTONE VIEW COMPANY (Incorporated)
Educational Department : : MEADVILLE, PA.
NEW YORK, N. Y. LONDON, ENG. TORONTO, CAN.
PORTLAND, ORE. SYDNEY, AUSTRALIA

In the Easy Vacation Season

The Best Time to Consider Your Map Needs

The vacation months are a good time to think over your map needs. Don't you want to put in that map or globe you have long been thinking about? Don't you want to put in a complete equipment?

With the Rand McNally House in your midst, and

The Largest Stock of Maps and Globes in the World at Your Door

your selection should be easy, and the cost as simple or heavy as you please to make it. Besides our own extensive stock to select from, you have the Kiepert, Stanford, Sprunes-Bretschneider and Sydow-Habenicht at hand, and any other foreign map you may wish us to import. Don't you find these suggestive?

Some of Our Specialties

Relief Maps, Political Maps, Physical Maps, Historical Maps, Language Maps, Outline Maps, Library Maps

Relief Globes, Physical Globes, Slated Globes, Political Globes, Library Globes, Celestial Globes, The Jones Model of the Earth

To make selection easier, we have prepared a NEW CATALOGUE along the most careful and comprehensive lines. Illustrated throughout, and supplied with every detail of information the map buyer could wish. In fact it is the largest and most complete catalogue ever issued by any map house in the world. Soon ready for distribution.

Map cases of many kinds and varieties. Our indestructible Cylindrical Steel Steel Map Case is one of the best—dust proof and portable.

RAND McNALLY & COMPANY

CHICAGO **NEW YORK**

N. E. A. in San Francisco July 8th to 15th, 1911.

Santa Fe

Don't fail to visit the Grand Canyon of Arizona

To the

N. E. A.

San Francisco, California
July 8 to 14, 1911

The San Francisco meeting will mark an epoch in the history of education in America.

Every teacher who can attend should make every effort to do so.

Granted that you are going—

The Santa Fe is the most interesting and most comfortable summer route to California.

Interesting, because of its historical associations, geography and geology. No similar area contains so many unique sights. You may see the many-storied villages of the Pueblo Indians, the most advanced of all the aboriginal Americans.

And the Petrified Forest, with its tens of thousands of agatized tree trunks and branches.

And Meteorite Mountain, made by the fall of a giant meteor that plowed a hole in the earth over six hundred feet deep and nearly a mile in diameter.

And, greatest of all, the **Grand Canyon of Arizona,** a mile deep, miles wide, and painted like a sunset.

Comfortable, because after reaching the mountains the track lies nearly a mile above sea level most of the way.

And because the cars are new, modern and perfectly appointed. The track is in fine condition.

You will enjoy the Fred Harvey meals—in dining cars on the California Limited—and in the station dining-rooms on other trains.

The train service is ample for every need. Four fast transcontinental trains daily, including the luxurious

California Limited

We want every teacher to read our Summer travel booklets Copies will be sent, together with a special N E A folder, free on request

W. J. Black, Passenger Traffic Manager,
1118 Railway Exchange, Chicago